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## Risk for Depression in Coronary Heart Disease Patients Meriting Post-Coronary Artery Bypass Graft Screening; Feasibility of Nurse-led Cognitive Behavioral Therapy among Patients with Depressive Symptoms

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The document mentioned above has been reviewed and accepted by the student's advisor, on behalf of the advisory committee, and by the Assistant Dean for MSN and DNP Studies, on behalf of the program; we verify that this is the final, approved version of the student's DNP Project including all changes required by the advisory committee. The undersigned agree to abide by the statements above.

Joy L. Coles, Student

Dr. Carol Thompson, Advisor

# POST-CORONARY ARTERY BYPASS GRAFT DEPRESSION SCREENING

## DNP Final Project Report

Risk for Depression in Coronary Heart Disease Patients Meriting Post-Coronary Artery Bypass  
Graft Screening; Feasibility of Nurse-led Cognitive Behavioral Therapy among Patients with  
Depressive Symptoms

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College of Nursing

Fall 2018

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## POST-CORONARY ARTERY BYPASS GRAFT DEPRESSION SCREENING

### Dedication

I would like to dedicate this project first and foremost to God and to my amazing and loving family. I am appreciative for my supportive and devoted husband Jermaine, three beautiful and loving children, my phenomenal mother who always provided unwavering support and my father, former US Airforce serviceman Joseph Jordan, who alongside my grandparents are all smiling from heaven. To all my family, you have sacrificed, cheered me on, and were patient with the various demands of DNP study. Many nights we gathered around the table to complete our homework together. Your hugs and “mommy you can do it” were sources of quiet strength for me. To my precious extended family and friends, leaders, co-workers and provider partners, there are so many individuals who supported me that there are too many to name. I thank each of you and I am extremely grateful for every gentle push, “keep going”, and “we are proud of you”! Thank you for your understanding and love. As I progressed through the program, you all were relentless in your effort to encourage me to finish. I could not have accomplished this without strength from the Lord and all of you.

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## Abstract

PURPOSE: The purpose of this Doctor of Nursing Practice (DNP) project was to implement depression screening with the Patient Health Questionnaire-9 (PHQ-9) among patients with Coronary Heart Disease (CHD) who have undergone a Coronary Artery Bypass Graft (CABG) and demonstrate the feasibility of a nurse-led Cognitive Behavioral Therapy (CBT) intervention.

METHODS: A non-experimental pre-test and post-test design was completed to screen for depression among patients post CABG in the Cardiovascular Intensive Care Unit (CVICU) at a University Hospital using the PHQ-9. A sample of 21 patients were identified and selected from a convenience sample by pulling every eligible record from Institutional Review Board (IRB) approval date. An evidence-based non-pharmacological (CBT) intervention for depressive symptoms was provided to patients with a PHQ-9 score of 5 or greater. Patients who received the CBT intervention were re-evaluated for depressive symptoms with the PHQ-9 at two weeks post-surgery. Follow-up care or referral was offered by the provider as appropriate if the patient continued to screen positive for depression after CBT intervention.

RESULTS: A total of 38% (8 out of 21) screened positive for depression. Of 8 patients total that screened positive for depression, 62.5% (5 out of 8) were re-screened post CBT-intervention from which 60% (N = 3) had lower PHQ-9 scores indicating reduced depressive symptoms. There was 1 patient death, 1 patient decline and 1 patient lost to follow-up. The paired t-test analysis examining the difference in PHQ-9 scores at pre- and post-CBT was not significant; however, this feasibility project was not powered to detect pre- and post-CBT differences in depression scores. Related to limited sample size, statistical significance was not shown ( $P=0.55$ ). Yet, the intervention was brief and acceptable to medically fragile patients. A large number of patients had the following comorbidities: 57.14% had Type 2 Diabetes, 38.1%

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Myocardial Infarction, 28.57% Heart Failure, 25% pre-existing depression, 85.71% Hypertension, 90.48% Hyperlipidemia, 33.33% Chronic Obstructive Pulmonary Disease, 23.81% obesity, 19.05% anemia, and 19.05% anxiety. Another 33.33% had current tobacco use with 19.05% with former tobacco use. The preliminary findings from this project confirm the prevalence of depression defined in the literature and show upon analysis 60% of those screened for depressive symptoms who received intervention improved after CBT.

CONCLUSION: Depression screening is important because the prevalence of depression in patients post CABG in this project were on par with the national average rates of depression among heart disease patients who have had a CABG. The World Health Organization (WHO) has estimated that by the year 2020, that both CHD and depression will be the two major causes of disability-adjusted life years. The recommendation made by American Heart Association (AHA) to screen all patients with CHD should be established routinely. Depression screening and CBT are both feasible and do not require many resources. Implementation of depression screening in acute and outpatient settings may lead to adequate treatment as recommended by the AHA. The quality of life and lifespan for this cohort of patients may improve in addition to prevention of adverse health outcomes caused by untreated depressive symptoms including but not limited to increased mortality and even suicide from untreated depressive symptoms.

# POST-CORONARY ARTERY BYPASS GRAFT DEPRESSION SCREENING

## Risk for Depression in Coronary Heart Disease Patients Meriting Post-Coronary Artery Bypass Graft Screening: Feasibility of Nurse-led Cognitive Behavioral Therapy among Patients with Depressive Symptoms

### **Introduction**

Coronary Artery Bypass Graft (CABG) surgery is a common treatment for Coronary Heart Disease (CHD), with more than 400,000 operations in the United States of America occurring each year (Center for Disease Control, 2015). Due to the high rates of depression among CABG patients both pre- and post-operatively; the American Heart Association (AHA) recommends depression screening for all patients with CHD (American Heart Association, 2008 and 2011). According to the AHA, however, nearly half of all providers do not screen for comorbid depression in patients with CHD, including patients post CABG (AHA, 2008).

In this evidence-based practice project, patients post CABG at an academic medical center were screened for depressive symptoms with the Patient Health Questionnaire-9 (PHQ-9) and offered CBT if the depression score was 5 or greater. The overall purpose of this DNP project was to implement depression screening among patients post CABG and demonstrate the feasibility of a nurse-led Cognitive Behavioral Therapy (CBT) intervention, in order to encourage routine screening practices among healthcare staff.

### **Background**

In 2015, an estimated 17 million adults over the age of 18 in the United States had at least one major depressive episode in the past year. This number represented 6.7% of all U.S. adults (American Psychiatric Association, 2017). However, rates of depression are much higher in people with CHD who experience a CABG. Nearly 1 out of 5 patients post CABG meet the

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American Psychiatric Association's Diagnostic and Statistical Manual IV (DSM-IV) criteria for a major or mild depressive episode during post-surgical recovery (Freedland et al., 2009).

Even with high rates of depression, many patients are not currently screened post-operatively for depression, and sometimes, treatment for pre-existing comorbid depression is not resumed post-operatively. Depression concurrent with a CABG is a strong predictor of post-operative complications, including a longer physical recovery period and a more difficult emotional recovery (Freedland et al., 2009). Although a large body of research has demonstrated that depression has a negative impact on the prognosis of patients post CABG, health care staff at some locations have delayed putting the evidence into clinical practice by not screening for and/or treating depression in patients post CABG.

In a 2013 study, Haddad et al. found that co-occurrence of depression in CHD led to poorer outcomes and raised mortality among 803 patients from the CHD registers in Greater London and concluded that the easy to administer PHQ-9 was a drastically superior tool in identifying depression. However, the United States Preventive Services Task Force (USPSTF) found little evidence that one tool is superior, and recommended that the most practical tool for the clinical setting should be utilized (Manea, Gilbody, & McMillan, 2015). The PHQ-9 is a brief depression screening tool able to be administered and completed within minutes with scores ranging from 0 to 27. The PHQ-9 also provides a severity score that can be used for treatment options and monitoring (Appendices A and B).

According to the Agency for Health Care Policy and Research (2017), depression is underdiagnosed and undertreated by primary care and other non-mental health practitioners as they do not currently screen. Adverse health effects of CHD and comorbid depression can become insurmountable and lead to poorer outcomes if left unscreened and untreated

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(Baumeister, Hutter, & Bengel, 2011). It is imperative that evidence-based practice to screen for depression be translated into the clinical setting (Reddy, Dunbar, Morgan, & O'Neil, 2008). A relatively easy way to screen for depressive symptoms is through the use of the PHQ-9. The PHQ9 is a 9-item, validated instrument that can screen and measure the level of depression through identifying the frequency of associated depressive symptoms.

Some health care staff are reluctant to screen patients with CHD for depression because they feel they cannot offer any therapy for this condition. However, depression may be successfully treated by psychotherapy such as Cognitive Behavioral Therapy, medication, or a combination of both (American Psychiatric Association, 2017). CBT is the psychotherapeutic intervention based on the Cognitive Model of depression. Researchers have found that Cognitive therapy (CT), referred to often by the generic term Cognitive Behavior Therapy (CBT), has had efficacy in treating depressive symptoms (Beck, 2005). In 1967, Dr. Aaron T. Beck, a psychiatrist, developed the Cognitive Behavioral Model of depression. The Cognitive Behavioral Model explained dysfunctional thinking (Beck, 2005), and offers a way to target that thinking through semi-structured counseling sessions. According to Freedland et al. (2009) CBT was effective for treating and relieving mild depressive symptoms.

Identification of depression is important and Cognitive Behavior Therapy may be more effective relative to usual care (Freedland et al., 2015). Cognitive Behavioral Therapy can benefit cardiac patients with depressive symptoms. In the Enhancing Recovery in Coronary Heart Disease Patients (ENRICHED) study, a randomized controlled trial, at least 12 to 16 sessions of cognitive behavioral therapy over 12 weeks were advocated to achieve remission of moderate to severe depression (Berkman, 2000). The investigators found statistical significance in a reduction in depressive symptoms in the intervention group when compared with the control

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group, at 6 months (Berkman, 2000). The ENRICHD investigators concluded that CBT should begin as soon as possible (within 28 days) after a cardiac event (Berkman, 2000). Moreover, there is a large evidence base supporting the use of CBT, and short treatments can also be helpful.

### **Conceptual Framework**

CBT is based upon the Cognitive Model, developed by Dr. Beck. In the Cognitive Model, cognitive perceptions of a situation can influence emotions, behaviors, and physical symptoms (Beck, 2005). In a stressful situation, a patient may have an inaccurate perception, and their thoughts may become counterproductive or negative. CBT helps the patient identify their thoughts, and evaluate how realistic the thoughts are, in an effort to change negative thoughts and improve mood. The Cognitive Model's purpose is to changing thinking and behavior, and it does so through interactions with a counselor that encourage the patient or individual to improve the utility of their thinking patterns (Beck, 2005).

Interventions aimed at changing dysfunctional thinking can improve the emotional, behavioral, and somatic symptoms of depression (Dekker et al., 2010). Dekker et al. (2010) demonstrated that bachelor's-prepared nurses can offer CBT to hospitalized patients at the bedside. CBT is consistent with nursing interventions of teaching patients to identify stressors or distress, strategies to lessen the impact of those stressors, and increase perceived control by the patient (Dekker, 2010). The primary objective of CBT is to change emotions and behavior by redirecting undesirable cognitive processes. This redirection may benefit heart disease patients who have depressive symptoms identified on a validated, reasonably sensitive and specific screening tool such as the PHQ-9.

### **Purpose**

This project implemented the AHA Science Advisory 2008 and subsequent 2011 recommendation to routinely screen all patients with CHD for depression including those who have had a CABG. The objectives of this evidence-based project were to:

- a) Implement routine screening for patients with CHD who have had a CABG in the Cardiovascular Intensive Care Unit.
- b) Provide patients who screen positive for depressive symptoms with nurse-led Cognitive Behavioral Therapy (CBT).
- c) Offer follow-up care and referral for patients who continue to screen positive for depressive symptoms two weeks post CBT intervention.

Depression worsens the prognosis for patients who have experienced a CABG surgery, leading to a 10-30% increase in the relative risk of mortality (Ski, Munnian, Rolley & Thompson, 2015). There is an increased risk of mortality and adverse outcomes at stake for patients post CABG with comorbid depression. According to the Cleveland Clinic (2018) nearly 20 percent of patients who have had a CABG surgery experience major depression. It is essential that patients receive care under a collaborative model that includes post-operative medication reconciliation for patients with pre-existing depression, routine depression screening, and subsequent treatment and/or treatment referral when warranted.

The Cardiovascular Intensive Care Unit (CVICU) at the academic medical center where this project was conducted does not currently routinely screen patients post CABG for depression. Researchers have found that nearly 30% to 40% of CABG surgery patients experience depression and anxiety disorders—a rate significantly higher than community



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samples (Tully & Baker, 2012). Patients post CABG who have co-morbid depression are required to cease taking all anti-depressants pre-operatively, so they are not on the list of current medications when the patient arrives at the hospital for surgery. These antidepressant medications are not consistently reconciled post-operatively, leaving patients at risk for untreated depressive symptoms related to not resuming their anti-depressant therapy.

The CVICU where this project took place is not alone—current evidence indicates that nearly 50% of all providers neither screen nor treat patients post CABG for depression (AHA, 2011). An AHA Science Advisory (2011) recommends all heart disease patients be screened for depression due to the increased risk of mortality due to untreated depression. In a cross-sectional study of 217 patients post CABG, researchers found that the benefits of screening include improved quality of life and improved adherence to treatment (Luttik, Jaarsma, Sanderman, & Fleer, 2011). Researchers have also found that it's possible to lower levels of depressive symptoms in patients post CABG via the use of pharmacological and/or non-pharmacological treatment modalities. Both Cognitive Behavioral Therapy (CBT) and Stress Management (SM) have been found to reduce depressive symptoms which may improve prognosis for patients recovering from a CABG (Freedland et al., 2009). Implementing routine screening is an evidence-based practice that is strongly recommended by the AHA, although they acknowledge that additional research and evaluation are necessary to validate this finding.

### **Project Design**

This project used a non-experimental pre-test and post-test design to establish routine depression screening among patients post CABG in the Cardiovascular Intensive Care Unit at a University Hospital, utilizing the validated PHQ-9. Upon consent, an evidence-based, non-pharmacological CBT intervention was provided for patients who had CHD and CABG surgery

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and scored a 5 or greater on the PHQ-9 indicating presence of depressive symptoms. All patients who received the intervention had a PHQ-9 score of 5 or greater. Patients post CABG who did not screen positive for depression did not receive CBT; however, all received usual care.

### **Methods**

#### **Procedures**

Data collection activities for this project was implemented after informed consent was obtained. IRB approval was obtained from the University Hospital, and the principal investigator was the sole researcher and carried out all recruitment activities, the intervention, and data collection. Data collection occurred from the end of August 2018 to mid-October. An initial patient visit lasted anywhere from 15 minutes to 1 hour or more for each patient; this visit included the consent process, depression screening with the PHQ-9, and the CBT intervention if the depression screen was positive with a score of 5 or greater. Only, two patients refused to consent to participate in the project. Nearly all patients were amenable to being screened for depression and receiving CBT intervention if warranted.

All project variables were entered into Excel, and PHQ-9 scores were entered into Qualtrics. Applicable project variables were stored on an encrypted computer. All data were de-identified, with a random subject ID assigned by Qualtrics software. Patient confidentiality was maintained throughout the project.

Evidence-based project participants were at least 18 years of age and were screened day 4 post-operatively or greater. The project participants were male and female with various ethnicities and backgrounds. In terms of illness history, the patients in the sample had a CABG and current hospitalization with various disease diagnoses in the past medical history and physical. The primary diagnosis was Coronary Heart Disease (CHD) or Coronary Artery Disease

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(CAD). The major purpose of this evidence-based project was to establish depression screening for all patients with CHD including those who have had a CABG. If a patient had a positive depressive symptom score (positive screening of 5 or greater score on the PHQ-9), the patient received CBT, then was re-screened with the PHQ-9 at their post CABG visit before cardiac rehabilitation. If the follow-up depression screen score was positive for depression (PHQ-9 score 5 or greater), the provider was notified and referred that patient for treatment and supportive services.

The effects of the CBT Intervention were assessed by using the PHQ-9 to re-screen each patient who was given the 30-minute session at the two week post-surgical clinic visit. This visit occurred after the patient was discharged from the hospital or entered cardiac rehabilitation. Patients who missed the follow-up post-surgical clinic visit at two weeks were contacted and re-screened via telephone.

The Patient Health Questionnaire 9 (PHQ-9) screening tool was stored on a password protected iPad. The screening tool is under current review with the University Hospital administration to have the PHQ-9 embedded in the Electronic Medical record (EMR) in the adult patient profile.

Patient records were reviewed throughout the data collection period. All who were enrolled received the following actions related to their depressive symptom scores: 1) patient, attending physician, staff nurse, and primary care provider were notified of PHQ-9 scores in-person by principal investigator (Appendices A and B); and 2) patients received the National Institute of Mental Health pamphlet on depression and heart disease (Appendix C). For those patients with depressive symptoms at baseline, the patient's provider was made aware of the PHQ-9 score at the conclusion of depression PHQ-9 re-screening follow-up or in the event of an

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increase in depressive symptoms greater than 25% from baseline. Furthermore, for safety reasons, the University Hospital suicide protocol outlined on the University Hospital Intranet was available. If the patient mentioned suicidal ideation at any time point, the policy would be followed. No subjects were identified as suicidal in this project.

Independent variables were abstracted and used to identify the population of interest. The University Hospital provided a list of qualifying patients through the EMR database and a minimum sample of 25 patients were screened, however, 50 patients were reviewed; 21 were eligible, and those that screened positive for depression were offered follow-up care offered as appropriate.

### **Sample**

The patients were identified and selected from a convenience sample by pulling every eligible record during the enrollment period from IRB approval date until the minimum sample size was achieved. Patients were re-screened for depression at the University clinic practice site at the initial post-surgical visit approximately two weeks after being sent home from the hospital after having a CABG heart surgery. The patient interview was comprised of re-screening with the PHQ-9 at the follow-up visit. The results of the patient interviews were presented to the cardiologist for treatment referral to primary care team or psychiatry department if the patient remained depressed with a positive depression screening PHQ-9 score of 5 or greater after CBT intervention.

Patients were recruited by asking each patient in the sample if they wanted to consent to participate in this project. Identification of the subjects was established after accessing their password protected and encrypted information in their EMR within the database after consent. Patients were approached in the hospital and at their follow-up visit at the University clinic.

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Patients were initially screened for depression while in the hospital four days post-operative or later to allow time for general anesthesia to leave systemic circulation. Patients were required to be alert and oriented with an Eye Motor Verbal profile on the Glasgow Coma Scale with a score of 15.

### **Setting**

The cardiovascular surgeons also referred to as cardiologist at the University Hospital were notified if their patients with CHD who just had a CABG were administered CBT after positive depression screen (PHQ-9 score of 5 or greater). There were a total of five cardiothoracic surgeons in the CVICU, one of which relocated during the project and one was promoted. All were agreeable as the patient's provider to have their patient screened for depressive symptoms and be offered CBT exhibiting feasibility. Each surgeon endorsed each patient being re-screened at the follow-up visit prior to or during cardiac rehabilitation if they were given the CBT intervention demonstrating acceptability. If the patient was unavailable for the follow-up visit, those patients were re-screened for depressive symptoms via telephone or at the University Hospital clinic practice site, at the initial post-surgical visit approximately two weeks after being sent home from the hospital post CABG.

No advertising flyer was submitted for IRB approval. Data were obtained from the encrypted, password protected EMR database on a computer in the CVICU on all cardiovascular patients who had CHD and a CABG heart surgery from the IRB approval date until the minimum sample size was achieved. The patient list was obtained from EMR and screening was done on or after day 4 post-surgery. Patients were in the hospital on post-op day 4 or after and consented while in the hospital. Those who did not meet the eligibility criteria to receive depression screening with the validated PHQ-9 were not consented. Adults who were ineligible to receive

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depression screening with the PHQ-9 and subsequent evidence-based CBT upon screening positive for depressive symptoms included those who have had a serious or life-threatening event, and/or were still intubated and/or sedated and unable to provide consent.

Patient confidentiality was preserved by coding each patient with a unique subject number, and storing the code number key on a password protected computer file on the University Hospital secured encrypted, password-protected server. Data was collected post CABG and at two-week follow-up.

The demographic variables were recorded and entered into statistical analysis software SPSS 23 owned by the PI. CBT continuing education training was completed by the principal investigator through the Beck Depression Institute, and was offered to patients who screened positive for depression utilizing the validated PHQ-9 depression screening tool post CABG. Patients were offered follow-up care via primary care or psychiatric provider referral if they re-screened positive for depression at their two week post-surgical clinic visit. Patients were contacted via telephone if they missed or were not scheduled for the follow-up clinic appointment to be re-screened with the PHQ-9 validated depression screening tool.

### **Description of Intervention**

The principal investigator was trained on the Cognitive Behavioral Model through the Beck Institute (2018). The CBT training course took 6 weeks to complete and consisted of an in-depth teaching on the principles, foundations, and tenets of CBT delivery. The principal investigator had to spend over 40-didactic and 60 clinical hours online in order to have adequate training in the delivery of CBT with patients with depressive symptoms. The principal investigator watched over 30 case examples of trained CBT expert delivery of CBT prior to

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bedside delivery as an RN in the CVICU with patients with CHD who have had a CABG.

Patients were engaged in various activities throughout the session (See Figure 1).

Socratic questioning were utilized as an evidence-based technique used in cognitive therapy (Beck Institute, 2018). This line of questioning helps the patient identify and contest the legitimacy of thoughts, beliefs and assumptions associated with a client's troubles, and is based on the dialectic questioning seen by Socrates (Beck, 1967). Patients were given the opportunity to express their thoughts and feelings and do a CBT training which taught the patient how to ask Socratic questions. Each patient was given an opportunity to formulate a coping response and write down the strategy on a sticky note. Each patient was given the National Institute of Health Pamphlet on Depression and Heart Disease (Appendix C) and equipped with coping tools to change negative thoughts. The coping skills were there to remind each patient of how to adjust their thinking and patients were informed that we would speak again in 2 weeks to re-assess their progress which would be captured through rescreening the patient on the PHQ9.

The session was summarized for the patient and the patient's feedback was solicited. The patient was notified that they would be asked the same nine questions on the PHQ-9 to re-screen them for depressive symptoms post-CBT intervention at their follow-up visit before cardiac rehabilitation or via telephone within the 2-week time period after the patient was initially consented.

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Session	Activities
CBT 30-minute Session (in hospital)	<ul style="list-style-type: none"><li>✓ Oriented patient to: purpose of intervention, collaboration between nurse-patient, number and length of session, role of homework</li><li>✓ Discussed link between depression, anxiety, and heart disease</li><li>✓ Told real-life stories of patients with heart disease that illustrate the link between stress, thoughts, feelings, and behaviors</li><li>✓ Asked patient to describe a recent stressful event, along with the thoughts, feelings, and behaviors that occurred in response to the stressor</li><li>✓ Taught patient how to ask Socratic questions</li><li>✓ Helped patient formulate a coping response and write it on a sticky note</li><li>✓ Homework assignment: read about coping and changing negative thoughts, notice automatic thoughts throughout week</li><li>✓ Summarized the session and get feedback from the patient</li></ul>

*Figure 1. RN-led Cognitive Behavioral Therapy Session Activities. Diagram from (Dekker, Tovar, Doering, Bailey, Campbell, Wright, & Moser, 2014). A single cognitive behavior therapy session improves short-term depressive symptoms in hospitalized patients with heart failure.*

*American Heart Association*

### Measures

In order to measure the outcomes of this DNP evidence-based practice project the following measures were examined for the project (see Table 1):

- 1) Demographic variables: Demographic variables included gender, age, ethnicity, marital status, tobacco use and heart disease classification of patients.
- 2) PHQ-9: The PHQ-9 is a nine-item instrument that measures depressive symptoms with severity scores. Responses to each question are on a 4 level Likert scale (0-3). A summary score is computed with a range of 0 to 27. A score of 5 or higher indicates clinical depression (Manea, Gilbody, & McMillan, 2015).



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The PHQ-9 has been shown to have sensitivity and specificity for patients with CHD of 61 percent and 94 percent respectively for mood disorders in adults. The first two questions of the PHQ-9 is the (PHQ-2). The PHQ-2 has a sensitivity of 100 percent and specificity of 77 percent in patients with heart disease (Li, Friedman, Conwell, & Fiscella, 2007). The psychometrics of PHQ-9 include a sensitivity and specificity of 88 percent when the depression score tool is used and the score is greater than or equal to 10 or more. PHQ-9 scores of 5, 10, 15, and 20 respectively indicate the level of depressive symptoms as mild, moderate, moderately severe and severe respectively (See Appendix B) (Kroenke, Spitzer & Williams, 2001). Lichtman et al. (2008) proposed that Cardiologists should take depression into account in the management of CHD, regardless of whether or not they treat the depression or if they decide to refer the patient to a healthcare provider who is qualified in the assessment and treatment of depression, which often may be the patient's own primary care provider. The PHQ-9 is inexpensive and relatively simple to administer and could provide the providers or their staff an uncomplicated way to screen patients for depressive symptoms.

### **Data Analysis**

The demographics of the sample were described using frequencies with percentages for nominal and ordinal variables and means with standard deviations for interval/ratio variables. The scores on the PHQ-9 at pre-test (post CABG) and post-test (post-CBT intervention) were described using means with standard deviations. A paired sample t-test was used to determine changes in PHQ-9 scores from pre-test (baseline) to post-test (post-CBT intervention).

### **Results**

A total of 21 patients were screened for depressive symptoms utilizing the PHQ-9. There was 1 patient death, 1 patient decline, 2 patient refusals to consent and 1 patient lost to follow-

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up. The patient demographic characteristics regarding age, gender, ethnicity, past medical history including smoking status, and depression score can be seen in Table 2 and 3. The patients ranged in age from 55 to 80 years of age, with a mean of 68. The mean age in years for those patients who were given nurse-led CBT intervention was 70.4 years of age. The majority of patients were Caucasian (95.24%) with 1 African-American (4.76%). Of the 8 patients with depressive symptoms, 87.5% (8 out of 21) were male with 12.5% (1 out of 8) were female. A documented history of comorbid depression was found in (9.5%) of all patients and in 25% (N=8) of patients who screened positive for depression and received the nurse-led CBT intervention. A total of 19.05% (N=21) of all patients had comorbid anxiety and 50% (N=8) of patients who scored positive for depressive symptoms on the PHQ-9 had pre-existing anxiety.

Comparisons were documented among comorbidities with a total of 57.14% with Type 2 Diabetes, 38.1% Myocardial Infarction, 28.57% Heart Failure, 19.05% Atrial Fibrillation, 33.33% current tobacco use, 19.05% former tobacco use, 85.71% Hypertension, 90.48% Hyperlipidemia, 33.33% Chronic Obstructive Pulmonary Disease, 23.81% obesity, 19.05% anemia, 19.05% anxiety with 100% CHD and CABG. Again, due to limited sample size the distribution of depression among comorbidities did not yield p-values < 0.5.

Upon analysis, the average reduction in depressive symptoms score was 1.2 (SD=1.83, range= 0-16) in comparison to when the patient was initially being screened. Depression screening made clinical staff aware of the patient's current status of depression level with the scoring tool providing context to mild, moderate, moderately severe, and severe (See Appendix A). A statistical comparison of patient variables were analyzed among those screened for depression (N=21). Using paired t-tests, the differences were not clinically significant related to limited sample size. However, most (60%) had a reduction in depressive symptoms post- nurse-

led CBT albeit it was not statistically significant. No other statistically significant differences in depression screening rates were found in any of the other variable groups based on gender, ethnicity, or past medical history ( $p>.05$ ). Frequencies are captured in Table 3 and the results from the t-tests.

### **Discussion**

In this evidence-based practice project, the prevalence of depression was similar to national averages as established by the Centers for Disease Control with average depression rates among heart disease patients at 38% (CDC, 2017). A history of depression was noted in only 10% of the entire surveyed group. Comparisons between the comorbidities (COPD, obesity, hypertension, type 2 diabetes) showed no significant differences in the rate or degree of depression. The average rates and severity scores reported in this project indicated a PHQ-9 score of 5 or greater with a max score of 16 qualifying most patients as having mild depression. The PHQ-9 was utilized for its ease of administration and availability to healthcare staff.

Only 8 patients out of 21 (38%) had an initial score of 5 or greater indicating depressive symptoms with severity based on that score (see Table 1). The effect of CBT is evaluated within 2 weeks which follows the same timeline for rescreening a patient on the PHQ-9. The PHQ-9 specifically asks “over the last two weeks” had a patient had a specific depressive symptom (See Appendix A). Allowing 2 weeks after the CBT intervention gave time for the patient to assess their progress with the homework and information learned during the nurse-led CBT intervention (See Figure 1).

This project showed that nurse-led CBT may be effective for patients who have mild depressive scores on the PHQ-9 (score of  $> 0$  or  $> 10$ ). One patient with comorbid depression did not benefit from the brief CBT intervention, indicating that some patients may require a more

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robust intervention and/or pharmacological management. However, CBT provided some reduction in depressive symptoms, yielding a 60% reduction of depressive symptoms among those who were screened, which resulted in a 1.2 point reduction in severity score. CBT was straight-forward and uncomplicated to deliver to patients with depressive symptoms on the PHQ-9. Most patients were receptive to the CBT activities as described in Figure 1. Patients were frequently relieved to have targeted therapy focusing on providing them with coping skills as they recovered from their CABG surgery. With only 2 patient refusals, 1 patient decline, and 1 patient lost to follow-up the screening with the PHQ-9 and subsequent CBT intervention if warranted showed acceptability. Several larger studies did multiple CBT sessions and showed efficacy with patients who received the intervention over several sessions (Dekker et al., 2010). It would be feasible to expand the study in order to provide multiple sessions. However, current evidence in the literature does indicate that brief sessions may be effective.

Depression treatment may vary based on severity level. Treatment with non-pharmacological interventions such as nurse-led CBT may offer improvement in the short-term in patients with depressive symptoms that are mild. Traditional pharmacological treatment may include a SSRI medication which has been deemed effective in multiple studies including the large multicenter, double-blind randomized control trial of 369 depressed patients with heart disease who were hospitalized known as SADHART “Sertraline treatment of major depression in patients with Acute Coronary Syndromes” study (Glassman et al., 2002). A collaborative care model is key to following-up with patients with depressive symptoms and exchanging clinical information between provider services in an effort to mitigate depressive symptoms; which increases the mortality rate among patients post CABG by 10-30%. Given the concern of time constraints as one factor in why providers do not screen their patients for depression, having a

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useful and relatively simple tool as the PHQ-9 available to screen and nurse-led CBT in place could improve screening and subsequent treatment rates (AHA, 2011).

### **Limitations**

A larger sample size is needed to indicate statistical significance verifying depression prevalence and correlation with CHD and CABG Heart Surgery. This was a single practice location with a non-diverse sample and small group numbers. Several limitations existed during the evidence-based project including the main Heart Surgeon being promoted to Chief of Surgery which decreased CABG surgeries listed as a result. A longer enrollment period and multi-site study would potentially lend to a larger sample size and increased depression screening and identification of subjects with depressive symptoms.

In future studies, care giver role strain evaluation should be coupled with screening of the patient with PHQ-9. During enrollment and project activities it was noted that the spouse, significant other or caregiver expressed need for depression screen and subsequent treatment. In nearly all patients that were screened for depressive symptoms, the caregiver was at the patient bedside during CBT-intervention, indicating an opportunity to evaluate both cohorts simultaneously.

### **Implications for Practice**

The resources that are needed to establish a screening protocol for CABG patients pre- and post-operatively would include training on the use of the validated tools for depression screening; Patient Health Questionnaire (PHQ) 2 and PHQ-9. Training on nurse-driven Cognitive Behavioral Therapy (CBT) treatment provided by Beck Depression Institute would also be necessary but may be time intensive and other opportunities for short competencies should be evaluated for implementation into practice. Community resources availability would

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need to be evaluated to assist with depression burden. Psychiatric or supportive services would need to be in place for patient follow-up. Implementing a Psychiatric Advanced Practice Registered Nurse on the patient care service lines may help alleviate any barriers to follow-up care or supportive services, giving patients access to psych services which often times is limited.

Also, copies of the PHQ-2 and PHQ-9 to be utilized by patients during screening would need to be available as a screening tool. Access and use of the electronic medical record at point of patient encounter if diagnosis of CHD or CAD is present including those patients who have had a CABG would be included. Expansion to other patients with CHD such as those on Ventricular Assist Devices as well as Extra Corporeal Membrane Oxygenation will be vital given rates for depression are even higher in these specialized cardiovascular populations. Providers that will champion screening patients pre- and post-operatively is needed to have widespread screening practices established. An embedment into the EMR along with provider alert capability would ensure scores are captured and appropriate follow-up care would be instituted. The process for initiation of medication reconciliation for patients with known comorbid depression pre-operatively is also important to mitigate the negative effects imposed upon the patient when comorbid untreated or undertreated depression is present. Interdisciplinary collaboration with Pharmacy and other disciplines may lend itself to ensuring patients have psychiatric medications restarted right away and a comprehensive approach to individualized patient care.

### **Conclusion**

In summary, the high prevalence of depression in patients with CHD including those that have had a CABG heart surgery supports a strategy of routine screening for depression. Routine screening can be assessed with the PHQ-9 and treatment or referral can subsequently be provided when merited. Improving routine depression screening implementation among providers in the critical care setting and post-operatively can be further enhanced by providing an evidence-based

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intervention such as CBT to decrease negative effects that result from comorbid depression in patients with CHD. Depression exacerbates adverse outcomes in patients with CHD including those who have had a CABG. Therefore, identifying depression in patients with CHD and those with a CABG is vital. This project sought to acknowledge depression exacerbates adverse outcomes in patients post CABG justifying the usefulness of screening all patients with CHD who have had a CABG and offering Nurse-led CBT which was effective.

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*Table 1.* Characteristics and Demographics: Post CABG depression screen with PHQ-9 and Nurse-led CBT (N =21).

Variable	All Patients (N=21) (%)	CBT Intervention (N=8) (%)	Post-CBT Re-screen (N=5) (%)
Comorbid Depression	9.5	<b>25</b>	0
Comorbid Anxiety	19.1	<b>50</b>	40
Age (years), mean +/- SD	68/(8.6)	68.8	70.4
Gender			
Male	66.7	87.5	80
Female	33.3	12.5	20
Race/ethnicity			
Caucasian	95.2	87.5	100
African American	4.8	12.5	0
Marital Status			
Married	47.6	62.5	60
Single	28.6	12.5	20
Widowed	9.5	12.5	20
Divorced	14.3	12.5	0
Current smoker	33.3	37.5	60
Former smoker	19.1	0	0



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Table 2. Means, standard deviations and ranges for selected continuous variables: Depression Screening with Patient Health Questionnaire – 9 (PHQ-9) (N =21) and Nurse-led post-Cognitive Behavioral Intervention (CBT) (N =5).

Variable	N	Mean	Standard Deviation	Minimum	Maximum
Age	21	68	8.6	55	80
Gender					
male	14	5.6	4.1	0	16
female	7	3.7	0.95	2	5
Married	10	6.5	4.5	2	16
PHQ-9 pre-	21	5	3.5	0	16
PHQ-9 post-CBT	5	5.6	2.5	4	10
Diff_PHQ-9	5	1.2	4.1	-5	6

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*Table 3.* Comorbidities: Post-CABG depression screen with PHQ-9 and Nurse-led CBT (N =21).

Comorbidities	N	Mean	Standard Deviation	%	P value
Anxiety	4	9	5.2	19%	0.19
Type 2 Diabetes	12	4	2.2	57%	0.45
Obesity	5	5	3.1	24%	0.78
Hypertension	18	5	2.5	86%	0.66
Hyperlipidemia	19	5	2.5	90%	0.64
Myocardial Infarction	8	4	2.3	38%	0.5
Heart Failure	6	4	0.9	29%	0.16
Atrial fibrillation	4	4	1.3	19%	0.44
Obstructive Sleep Apnea	3	4	1.5	14%	0.49
Chronic Obstructive Pulmonary Disease	7	5	1.6	33%	0.62
Hypothyroidism	3	6	3.2	14%	0.49
Chronic Kidney Disease	10	4	1.3	48%	0.17

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## Appendix A

### PATIENT HEALTH QUESTIONNAIRE (PHQ-9)

NAME: \_\_\_\_\_ DATE: \_\_\_\_\_

Over the last 2 weeks, how often have you been  
bothered by any of the following problems?  
(use "✓" to indicate your answer)

	Not at all	Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself—or that you are a failure or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed. Or the opposite —being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3
9. Thoughts that you would be better off dead, or of hurting yourself	0	1	2	3

add columns  +  +

(Healthcare professional: For interpretation of TOTAL, please refer to accompanying scoring card). TOTAL:

Appendix B

PHQ-9 Patient Depression Questionnaire

**For initial diagnosis:**

1. Patient completes PHQ-9 Quick Depression Assessment.
2. If there are at least 4 ✓s in the shaded section (including Questions #1 and #2), consider a depressive disorder. Add score to determine severity.

***Consider Major Depressive Disorder***

- if there are at least 5 ✓s in the shaded section (one of which corresponds to Question #1 or #2)

***Consider Other Depressive Disorder***

- if there are 2-4 ✓s in the shaded section (one of which corresponds to Question #1 or #2)

**Note:** Since the questionnaire relies on patient self-report, all responses should be verified by the clinician, and a definitive diagnosis is made on clinical grounds taking into account how well the patient understood the questionnaire, as well as other relevant information from the patient.

Diagnoses of Major Depressive Disorder or Other Depressive Disorder also require impairment of social, occupational, or other important areas of functioning (Question #10) and ruling out normal bereavement, a history of a Manic Episode (Bipolar Disorder), and a physical disorder, medication, or other drug as the biological cause of the depressive symptoms.

**To monitor severity over time for newly diagnosed patients or patients in current treatment for depression:**

1. Patients may complete questionnaires at baseline and at regular intervals (eg, every 2 weeks) at home and bring them in at their next appointment for scoring or they may complete the questionnaire during each scheduled appointment.
2. Add up ✓s by column. For every ✓: Several days = 1 More than half the days = 2 Nearly every day = 3
3. Add together column scores to get a TOTAL score.
4. Refer to the accompanying **PHQ-9 Scoring Box** to interpret the TOTAL score.
5. Results may be included in patient files to assist you in setting up a treatment goal, determining degree of response, as well as guiding treatment intervention.

**Scoring: add up all checked boxes on PHQ-9**

**For every ✓** Not at all = 0; Several days = 1;  
More than half the days = 2; Nearly every day = 3

**Interpretation of Total Score**

Total Score	Depression Severity
1-4	Minimal depression
5-9	Mild depression
10-14	Moderate depression
15-19	Moderately severe depression
20-27	Severe depression

# Depression and

# Heart Disease

## **Symptoms of Depression**

- **Persistent sad, anxious, or "empty" mood**
- **Feelings of hopelessness, pessimism**
- **Feelings of guilt, worthlessness, helplessness**
- **Loss of interest or pleasure in hobbies and activities that were once enjoyed, including sex**
- **Decreased energy, fatigue, being "slowed down"**
- **Difficulty concentrating, remembering, making decisions**
- **Insomnia, early-morning awakening, or oversleeping**
- **Appetite and/or weight changes**
- **Thoughts of death or suicide or suicide attempts**
- **Restlessness, irritability**

***If five or more of these symptoms are present every day for at least two weeks and interfere with routine daily activities such as work, self-care, and childcare or social life, seek an evaluation for depression.***

### **For more information about depression and research on mental disorders, contact:**

National Institute of Mental Health (NIMH)  
Office of Communications and Public Liaison  
Information Resources and Inquiries Branch  
6001 Executive Blvd., Rm. 8184, MSC 9663  
Bethesda, MD 20892-9663  
Phone: 301-443-4513  
TTY: 301-443-8431  
Fax: 301-443-4279  
Mental Health FAX 4U: 301-443-5158  
E-mail: [nimhinfo@nih.gov](mailto:nimhinfo@nih.gov)  
Web site: <http://www.nimh.nih.gov>

NIMH Depression Publications  
Toll-free: 1-800-421-4211

Depression can strike anyone.

However, research over the past two decades has shown that people with heart disease are more likely to suffer from depression than otherwise healthy people, and conversely, that people with depression are at greater risk for developing heart disease.<sup>1</sup> Furthermore, people with heart disease who are depressed have an increased risk of death after a heart attack compared to those who are not depressed.<sup>2</sup> Depression may make it harder to take the medications needed and to carry out the treatment for heart disease. Treatment for depression helps people manage both diseases, thus enhancing survival and quality of life.

Heart disease affects an estimated 12.2 million American women and men and is the leading cause of death in the U.S.<sup>3</sup> While about 1 in 20 American adults experiences major depression in a given year, the number goes to about 1 in 3 for people who have survived a heart attack.<sup>4,5</sup>

Depression and anxiety disorders may affect heart rhythms, increase blood pressure, and alter blood clotting. They can also lead to elevated insulin and cholesterol levels. These risk factors, with obesity,



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form a group of signs and symptoms that often serve as both a predictor of and a response to heart disease. Furthermore, depression or anxiety may result in chronically elevated levels of stress hormones, such as cortisol and adrenaline. As high levels of stress hormones are signaling a “fight or flight” reaction, the body’s metabolism is diverted away from the type of tissue repair needed in heart disease.

Despite the enormous advances in brain research in the past 20 years, depression often goes undiagnosed and untreated. Persons with heart disease, their families and friends, and even their physicians and cardiologists (physicians specializing in heart disease treatment) may misinterpret depression’s warning signs, mistaking them for inevitable accompaniments to heart disease. Symptoms of depression may overlap with those of heart disease and other physical illnesses. However, skilled health professionals will recognize the symptoms of depression and inquire about their duration and severity, diagnose the disorder, and suggest appropriate treatment.

### **Depression Facts**

Depression is a serious medical condition that affects thoughts, feelings, and the ability to function in everyday life. NIMH-sponsored research estimates that almost 10 percent of American adults, or about 19 million people, experience some form of depression every year.<sup>4</sup> Although available therapies alleviate symptoms in over 80 percent of those treated, less than half of people with depression get the help they need.<sup>4,6</sup>

Depression results from abnormal functioning of the brain. The causes of depression are currently a matter of intense research. An interaction between genetic predisposition and life history appear to determine a person’s level of risk. Episodes of depression may then be triggered by stress, difficult life events, side effects of medications, or other environmental factors. Whatever its origins,

depression can limit the energy needed to keep focused on treatment for other disorders, such as heart disease.

### **Heart Disease Facts**

Heart disease includes two conditions called angina pectoris and acute myocardial infarction (“heart attack”). Like any muscle, the heart needs a constant supply of oxygen and nutrients that are carried to it by the blood in the coronary arteries. When the coronary arteries become narrowed or clogged and cannot supply enough blood to the heart, the result is coronary heart disease. If not enough oxygen-carrying blood reaches the heart, the heart may respond with pain called angina. The pain is usually felt in the chest or sometimes in the left arm and shoulder. (However, the same inadequate blood supply may cause no symptoms, a condition called silent angina.) When the blood supply is cut off completely, the result is a heart attack. The part of the heart that does not receive oxygen begins to die, and some of the heart muscle may be permanently damaged.

Chest pain (angina) or shortness of breath may be the earliest signs of heart disease. A person may feel heaviness, tightness, pain, burning, pressure, or squeezing, usually behind the breastbone but sometimes also in the arms, neck, or jaws. These signs usually bring the person to a doctor for the first time. Nevertheless, some people have heart attacks without ever having any of these symptoms.

Risk factors for heart disease other than depression include high levels of cholesterol (a fat-like substance) in the blood, high blood pressure, and smoking. On the average, each of these doubles the chance of developing heart disease. Obesity and physical inactivity are other factors that can lead to heart disease. Regular exercise, good nutrition, and smoking cessation are key to controlling the risk factors for heart disease.

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Heart disease is treated in a number of ways, depending on how serious it is. For many people, heart disease is managed with lifestyle changes and medications, including beta-blockers, calcium-channel blockers, nitrates, and other classes of drugs. Others with severe heart disease may need surgery. In any case, once heart disease develops, it requires lifelong management.

### **Get Treatment for Depression**

Effective treatment for depression is extremely important, as the combination of depression and heart disease is associated with increased sickness and death. Prescription antidepressant medications, particularly the selective serotonin reuptake inhibitors, are generally well-tolerated and safe for people with heart disease. There are, however, possible interactions among certain medications and side effects that require careful monitoring. Therefore, people being treated for heart disease who develop depression, as well as people in treatment for depression who subsequently develop heart disease, should make sure to tell any physician they visit about the full range of medications they are taking.

Specific types of psychotherapy, or “talk” therapy, also can relieve depression. Ongoing research is investigating whether these treatments also reduce the associated risk of a second heart attack. Preventive interventions based on cognitive-behavior theories of depression also merit attention as approaches for avoiding adverse outcomes associated with both disorders. These interventions may help promote adherence and behavior change that may increase the impact of available pharmacological and behavioral approaches to both diseases.

Exercise is another potential pathway to reducing both depression and risk of heart disease. A recent study found that participation in an exercise training program was comparable to treatment with an antidepressant medication (a selective serotonin

reuptake inhibitor) for improving depressive symptoms in older adults diagnosed with major depression.<sup>7</sup> Exercise, of course, is a major protective factor against heart disease as well.

Use of herbal supplements of any kind should be discussed with a physician before they are tried. Recently, scientists have discovered that St. John's wort, an herbal remedy sold over-the-counter and promoted as a treatment for mild depression, can have harmful interactions with some other medications. (See the alert on the NIMH Web site: <http://www.nimh.nih.gov/events/stjohnwort.cfm>.)

Treatment for depression in the context of heart disease should be managed by a mental health professional—for example, a psychiatrist, psychologist, or clinical social worker—who is in close communication with the physician providing the heart disease treatment. This is especially important when antidepressant medication is needed or prescribed, so that potentially harmful drug interactions can be avoided. In some cases, a mental health professional that specializes in treating individuals with depression and co-occurring physical illnesses such as heart disease may be available.

While there are many different treatments for depression, they must be carefully chosen by a trained professional based on the circumstances of the person and family. Recovery from depression takes time. Medications for depression can take several weeks to work and may need to be combined with ongoing psychotherapy. Not everyone responds to treatment in the same way. Prescriptions and dosing may need to be adjusted. No matter how advanced the heart disease, however, the person does not have to suffer from depression. Treatment can be effective.

Other mental disorders, such as bipolar disorder (manic-depressive illness) and anxiety disorders, may occur in people with heart disease, and they too can

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be effectively treated. For more information about these and other mental illnesses, contact NIMH.

Remember, depression is a treatable disorder of the brain. Depression can be treated in addition to whatever other illnesses a person might have, including heart disease. If you think you may be depressed or know someone who is, don't lose hope. Seek help for depression.

### **For more information about heart disease, contact:**

National Heart, Lung, and Blood Institute (NHLBI)  
Information Center  
P.O. Box 30105  
Bethesda, MD 20824-0105  
Phone: 301-592-8573  
Heart Health Toll-Free Information Line:  
1-800-575-WELL  
E-mail: [NHLBIinfo@rover.nhlbi.nih.gov](mailto:NHLBIinfo@rover.nhlbi.nih.gov)  
Web site: <http://www.nhlbi.nih.gov>

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